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ORGANIZATIONAL ANALYSIS OF CONSTRUCTION PROJECTS

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ORGANIZATIONAL ANALYSIS OF CONSTRUCTION PROJECTS

ANALYSE DE L'ADMINISTRATION DE PROJETS DE CONSTRUCTION

W. Hughes

SUMMARY

This research project is about the analysis of construction project organizations. The work is based on organizational theory, and is a development of Linear Responsibility Analysis (LRA). The aim is to assess the extent to which project success is affected by organizational structure. The analysis of four public sector case studies raises several issues which are addressed by the research project. The first issue is the need for a systematic method of describing and analysing construction project environments. A framework has been developed which meets this need. The second issue is the extent of commonality between construction projects. A set of stages of work have been identified; the case studies confirm that they are appropriate to a wide range of projects. The third issue is the need for a graphical technique which enables concise descriptions of project organizational structures. The technique offered is called "3R" charting, which represents Roles, Responsibilities and Relationships. The last issue is the problem of evaluating success in construction projects so that the relevance of organizational issues can be assessed. It is proposed that there are three dimensions to this problem; the viewpoint of the person making judgements, the stage of the project, and the criteria by which the judgment is being made. Finally, brief recommendations are given for a strategy for organizational design to be used on construction projects.

RÉSUME

Cette étude est consacrée a l'analyse de la structure organisationelle de projets de construction. Le travail se fonde sur la théorie de l'organisation, étant un développement de l'analyse linéaire de responsabilité (LRA). Le but de l'étude est d'établir jusqu'a quel point la structure organisationnelle peut influencer le succès d'un projet. L'analyse de quatre cas particuliers choisis dans le secteur public soulève plusieurs questions qui sont abordées dans cette etude. La première concerne la nécessite d'une méthode systématique pur décrire et analyser l'environnement d'un projet de construction. On a mis au point une structure pour combler cette lacune. La deuxième question est de savoir jusqu'a quel point l'on peut dire que deux projets de construction se ressemblent. Un certain nombre d'étapes de travail ont été identifiés; les analyses particulières confirment que ces étapes s'appliquent à une grande variété de projets. La troisième question concerne la nécessité d'une technique graphique permettant de résumer succinctement la structure organisationelle d'un projet. La technique proposée ici s'appelle une "graphique 3R", ce qui représénte les Rôles, les Responsabilitiés et les Relations. Ensuite on aborde le probleme de l'évaluation du succès d'un projet de construction, afin de pouvoir établir l'influence du facteur organisationnel. On suggère ici que ce problème comporte trois éléments: le point de vue adopté, l'étape du projet et les critères. Enfin on donne des recommandations sommaires pour établir une stratégie de structure organisationelle susceptible à être mise en pratique pour les projets de construction.

ORGANIZATIONAL ANALYSIS OF CONSTRUCTION PROJECTS

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0 INTRODUCTION

This research project is a continuation of an SERC grant (from the Specially Promoted Programme in Construction Management) which was awarded to Liverpool Polytechnic in 1982, to Dr. A. Walker (now Professor Walker at Hong Kong University). The project was to examine the effectiveness of building project organizations, using a model developed by Tony Walker, based upon a variety of different sources (1). The work has continued on this project at Liverpool Polytechnic, and has formed the basis of my own PhD research programme which is now drawing near to completion.

The starting point for this research is the well-documented dissatisfaction of building clients with the way in which the construction industry organizes itself, and with many of the buildings it produces (2,3,4). The need was for tools to systematically describe and evaluate a range of project organizational structures. Existing techniques were few and limited in their application. The SERC study applied Walker's model to four public sector case studies (5). Since then, the model has been developed and refined. This work has resulted in six interconnected aspects. The aim of this paper is simply to introduce the work which has been undertaken.

1 ORGANIZATIONAL THEORY

A study of organizational theory revealed a series of issues which need to be analysed when examining organization structures. It became clear that in general terms, what was true for other industries was also true for construction. In terms of meeting the goal of maximising the chances of project success through appropriate organizational structure, the following hypotheses were proposed:

(a) the organization structure should provide a level of skill diversity matching the level of environmental complexity

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[1]N.B. Since being invited to contribute to this workshop, the author has moved to Reading University. Any enquiries regarding this work should be directed to the author at the Department of Construction Management, Reading University, Whiteknights, Reading, RG6 2BU, UK.

(b) the level of differentiation in the operating system should be matched by a corresponding level of co-ordination

(c) the organization structure should provide adequate feedback loops

(d) proper control mechanisms should be provided

(e) continuity of the managing system should be ensured

(f) there should be no duplication of the managing system

(g) opportunities for client involvement should be provided at every stage

Each hypothesis was tested, but in order to undertake rigorous analysis of project management structures, certain other issues became critical. These are described below.

2 SYSTEMATIC ENVIRONMENTAL DESCRIPTION

If skill diversity is to be matched to environmental complexity, there needs to be some method of assessing the level of complexity in the environment. A technique has been developed which allows this to be done (6).

Very briefly, it consists of identifying the levels of definition, stability and mitigability, of each of five types of environmental influence considered to form the immediate boundary to project management systems. These five type of environmental influence are Financial, Policy, Legal, Technological and Aesthetic. The combination of these factors forms and defines the micro-environment of the construction project. This is in turn bounded by the macro-environment which is constituted of Economic, Political, Social, Physical and Cultural factors. Since these are more stable and fixed in relation to a particular construction project, it is unnecessary to undertake detailed analysis of their individual effects on the project. The micro-environmental factors are the important ones in terms of environmental analysis.

Between the environment and the construction project the management structure has the task of interpreting and mitigating environmental influences on the project. This is done through the process of control which also has five aspects; Budget, Time, Contractual, Functional and Quality. Although these factors are inter-related in a very complex way, they are each closely connected with particular influences from the micro-environment. This is indicated by their juxtapositions in figure 1.

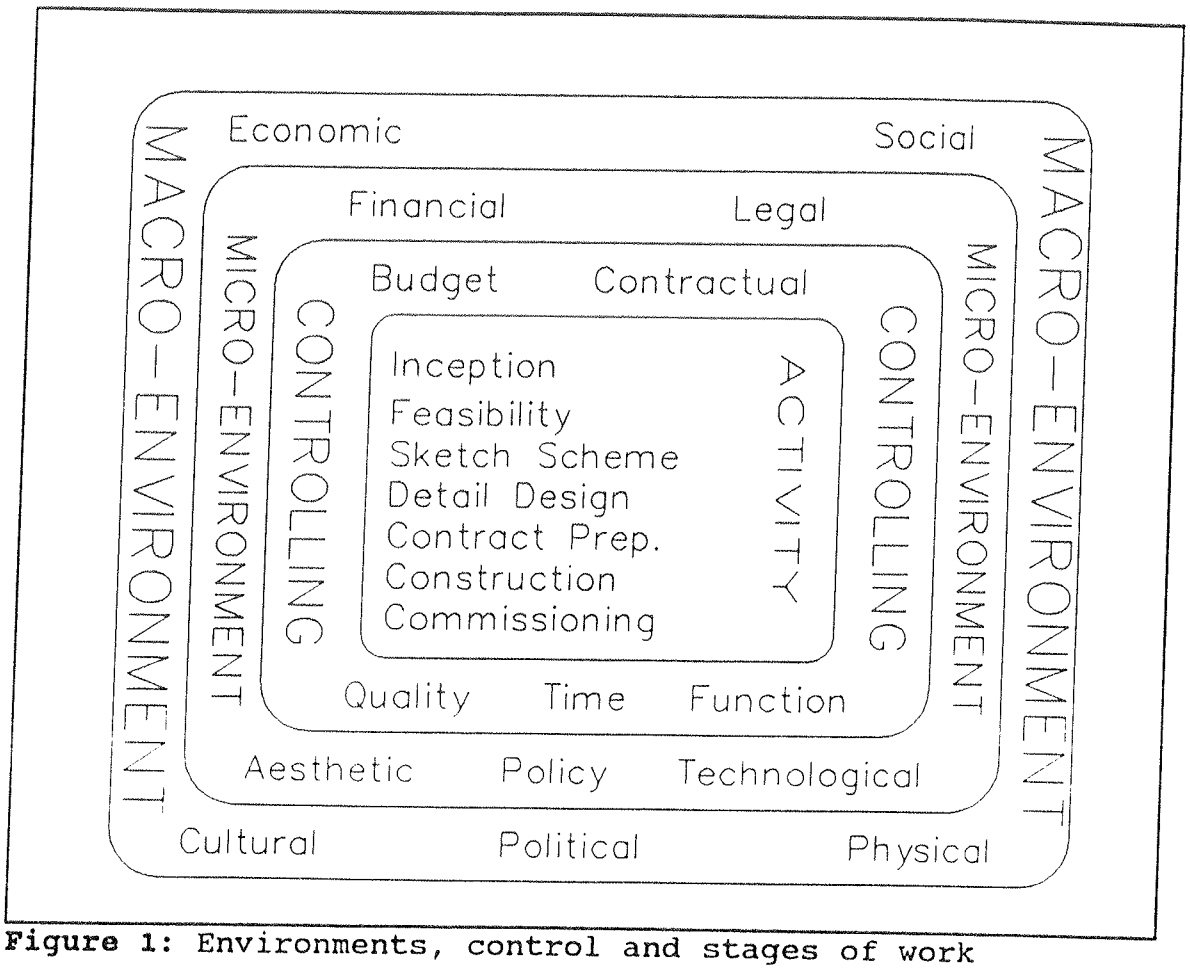

Figure 1: Environments, control and stages of work

3 COMMON STAGES OF WORK

An analysis was undertaken of the way in which the industry organizes itself. Seven different interpretations of construction projects were analysed (7,8,9,10,11,12,13). This analysis resulted in the identification of decision points and stages of work common to all projects. The stages of work are Inception, Feasibility, Sketch Scheme, Detail Design, Contract Preparation, Construction, Commissioning. Each is terminated by a decision which forms the trigger for the next stage (unless the project is aborted). The case studies that have been undertaken demonstrate that a wide range of projects match this model. Figure 1 shows how the stages of work relate to the control systems and environments typically found on construction projects.

Within the stages of work, the pattern of roles, responsibilities and relationships will be unique for each project. They are dictated by the circumstances of the project, and most importantly by its objectives. The stages of work are triggered and terminated by strategic decision points as described above. Within each stage of work the activity is further sub-divided by tactical decision points which break the work into groups of operations. Between operations are the lowest level of decision points, operational decisions. The relationships between these levels of decision making and operations are illustrated in figure 2.

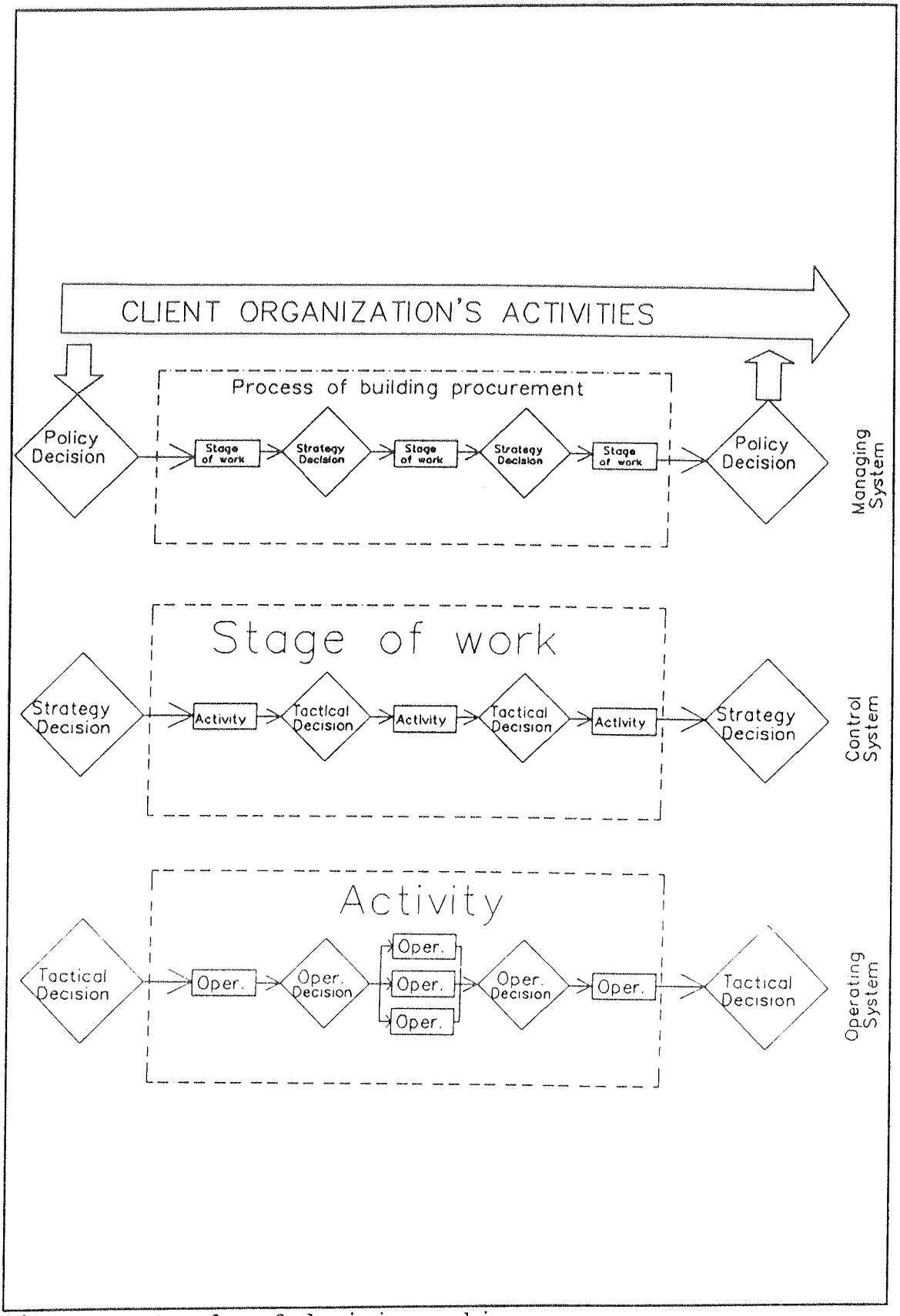

Figure 2: Levels of decision making

4 NEW GRAPHICAL TECHNIQUE

In order to analyse organizational structure, some method had to be found to describe the observations made, in such a way as to facilitate their analysis. The graphical technique pioneered by Walker, Linear Responsibility Analysis (LRA), was used as a starting point. It was found that projects in the public sector were simply too large and complicated to be accommodated by this technique.

Because of the problems associated with LRA a new technique has been developed, which draws strongly on Walker's antecedents (14). The new charts are called 3R charts; the three R's are Roles, Responsibilities and Relationships.

This new technique combines the matrix approach with a precedence diagram, and adds a series of symbols which represent roles. One chart is developed for each of the stages of work described above, and the whole project organizational structure, in all of its detail, is represented on a few sheets of A4 paper.

Figure 3 shows an example of a 3R chart which illustrates one stage of work from one of the case studies.

5 POST-OCCUPANCY EVALUATION

Clearly, if any comment is to be made on the adequacy of an organizational strategy, it must be related to the level of success achieved by the project under consideration. The construction industry is notoriously bad at evaluating the things it produces. In systems terms, feedback loops are few and far between. A thorough search was undertaken by Sheila Secker, one of the research assistants in the original SERC programme, and it was clear that there was little evidence of any systematic techniques for appraising the level of project success.

The lessons learned from this search were applied to the development of a framework for building evaluation. This represents three dimensions of project success, namely the viewpoint of the person making judgments, the point in a building's life when the judgment is being made, and the criteria by which the judgment is being made. This framework gives the basis for sorting out the relative weightings of different opinions of the success of projects, and from this an evaluation can be made.

6 STRATEGY FOR ORGANIZATIONAL DESIGN

The research has indicated that there are definite advantages in adhering to the principles of good organization. The work has been based on retrospective case studies in the public sector (15), which have been added to the lessons learned from Tony Walker's case studies in the private sector (16,17,18).

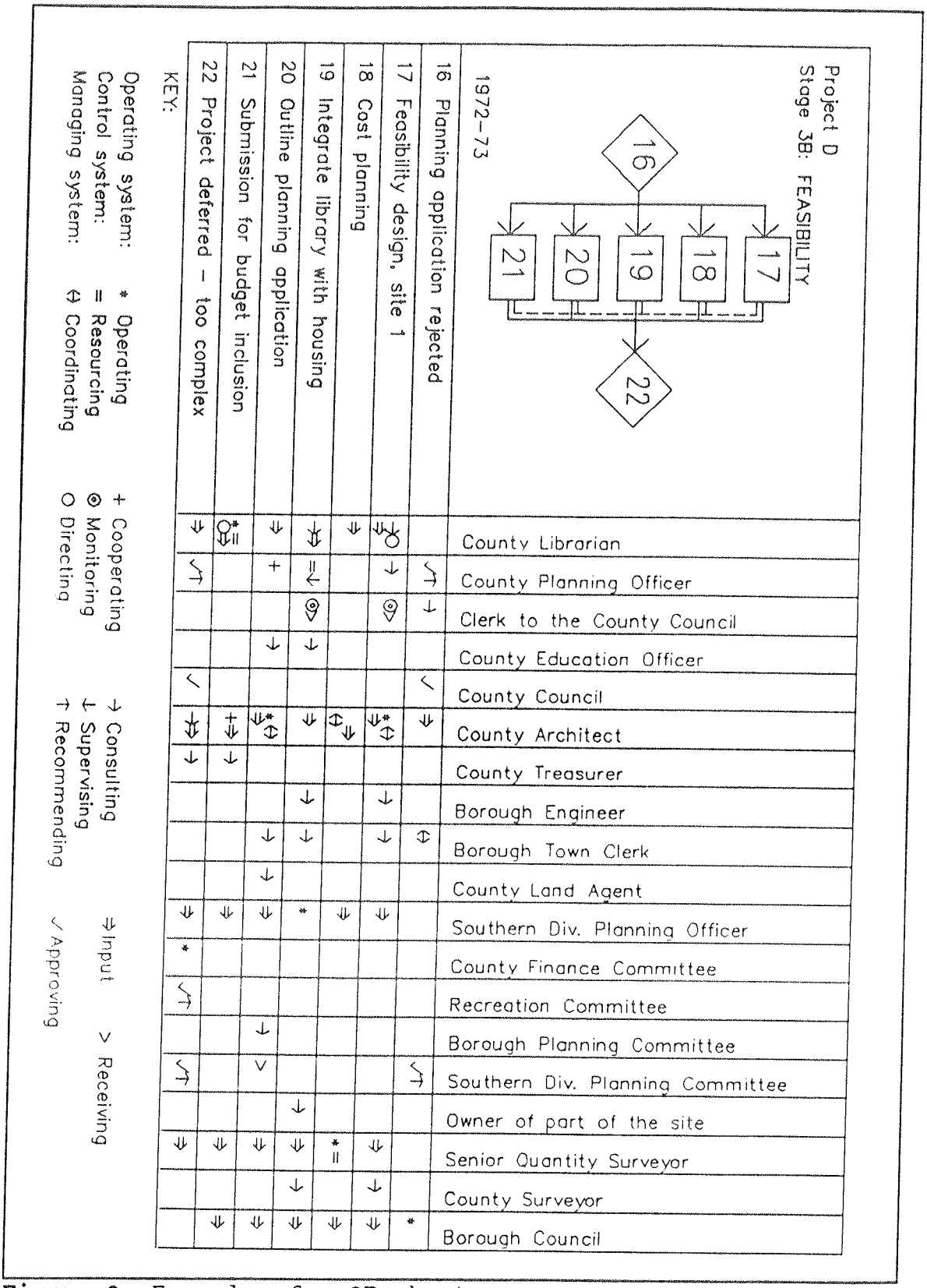

Figure 3: Example of a 3R chart

As a result of these case studies, the following steps are recommended when setting up a construction project organization:

DESIGNING A PROJECT ORGANIZATION

1. The (project) manager convinces the client of the need to design the organizational structure.

2. The organizational structure needs to be designed at the outset of the project.

3. The objectives of the project should be defined in terms of the effects intended on the environment.

4. Policy decision points are identified.

5. Within each Policy system, Strategic Decisions are identified.

6. Within each Strategy Sub-system, Tactical decisions and Operations are identified.

7. Responsibilities for Operations are defined.

8. The requisite level of control is super-imposed on to the responsibilities, relating to the achievement of the objectives defined in step 3. The management structure is thus identified.

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